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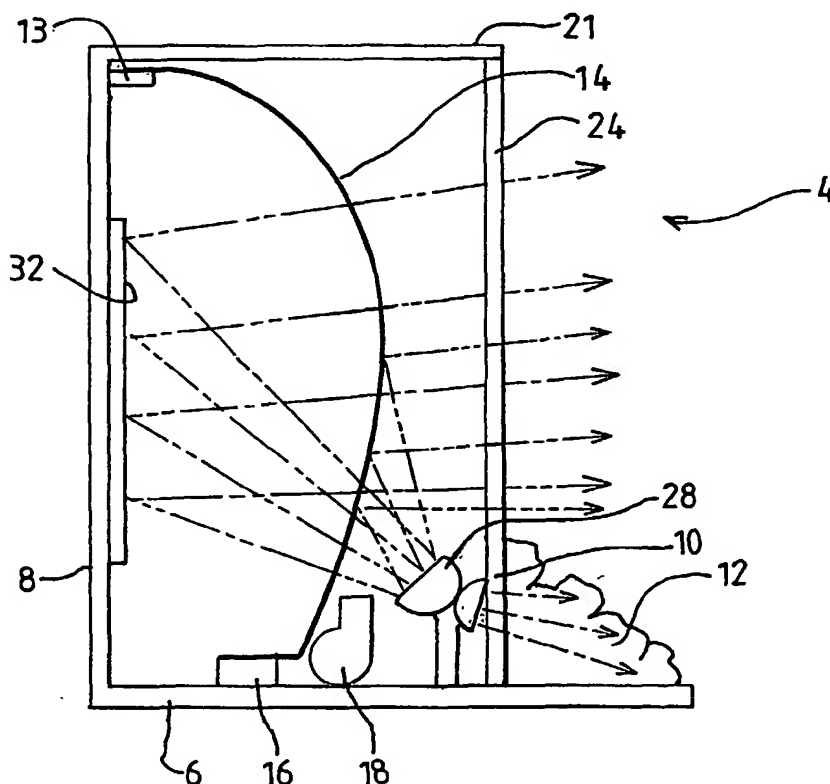
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[Continued on next page]

(54) Title: SPACE HEATER



(57) Abstract: A space heater comprises a housing (4) having a rear wall (8) and a front wall (10). Located forwardly of the front wall is a solid fuel effect means (12). Heating means is provided, in conventional manner. Suspended within the housing (4) by an upper support (30) is a flame effect means which in a preferred embodiment is in the form of a sheet of lightweight flexible material, the sheet being provided with elongate openings (20). Means (18) is provided to cause the sheet (14) to move, specifically by directing a flow of air upwardly against the material, to cause the material to billow. Light is directed from a light source (28) against the flame effect means (12), some light being reflected from the flame effect means directly through a translucent screen (24), some light passing through openings (20) of the sheet (14) onto a reflector (32), and being reflected from the reflector back through the sheet (14), and through the screen (24).



ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT, SE, SI, SK, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

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— *with international search report*

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

Title: Space Heater

Description of Invention

This invention relates to space heaters, and particularly but not exclusively to apparatus for simulating flames in a solid fuel effect fire, to give the impression of flames emanating from combusting fuel.

A conventional space heater, herein referred to as being of the kind specified, comprises a housing, heating means in the housing, a flame effect means in the housing, a source of light to illuminate the flame effect means in the housing, and a screen through which light is transmitted from the housing. Frequently a means is provided, such as by a fan or mechanical means, to cause the flame effect means to move in the housing, and frequently the screen is translucent, to make the visual effect produced within the housing somewhat diffuse.

Several arrangements have been used in the past to simulate flames in apparatus of the kind specified. For example, in GB-A-968568, there is shown an apparatus in which the flame effect means comprises a plurality of reflective ribbons suspended adjacent to a rear part of the fire, the light source being located forwardly of the ribbons, with a translucent screen also being located forwardly of the ribbons, such that light from the light source reflected from the ribbons is incident on a rear face of the screen, giving a flame effect when the screen is viewed from the front.

As another example, it is known from GB-A-1186655 to suspend the ribbons in front of the light source, so that light is transmitted between the strips directly onto the translucent screen.

In the specification of our European patent specification EP 0986722 - A, the flame effect means is in the form of a sheet of translucent material, such as crepe-de-chine, which is provided with a plurality of vertically-extending elongate slits, the material being located optically between the light source and

the screen. A fan within the housing causes the material to billow, and the slits periodically to open a short distance, allowing light to be transmitted directly onto the screen, thus simulating a flame.

It has been appreciated by the present inventor, that in the past the primary attention has been directed towards producing relatively high levels of light falling on the screen, and that this has not been particularly conducive to producing a high quality simulated flame.

Conversely, and in accordance with this invention, there is provided a space heater characterised by the feature that light is directed from the light source through the flame effect means onto a reflector, and reflected light passes again through the flame effect means onto the screen.

Preferably the flame effect means comprises a sheet of flexible material, and is preferably generally matt, producing only a low level of reflected light. For example, the flame effect means may be provided by a sheet of silky material, such as crepe-de-chine, preferably being of a dark colour, such as dark red, or even black.

Preferably the flame effect means provides openings, means being provided to cause the flame effect means to move in the housing thereby causing the openings to move.

Preferably the openings which are provided in the sheet are elongate, and the material is suspended loosely within the housing, being caused to "billow" by the flow of air directed there across, or by mechanical means. Such billowing will cause the slits to open, and for these openings to be seen to travel vertically in the upwards direction, or if desired, downwardly.

Light passing through the screen will be provided at four levels, as follows:

- a) light which passes from the source through the material of the flame effect means to the reflector and from the reflector back through the material of the flame effect means onto the screen;

bi) light which passes from the source through an opening in the material of the flame effect means to the reflector and through the material onto the screen;

bii) light which passes through the material onto the reflector and onto the screen via the material of the flame effect means;

c) light reflected from the flame effect means directly onto the screen;

d) light passing from the source through one of the openings onto the reflector, and from the reflector back through one or other of the openings onto the screen.

Conveniently, levels a) and b) may be maintained at a low, ineffective level, whilst the level c) is sufficient only to provide a low level background glow.

Light at level d) will be intermittent, but at a relatively high level, providing a "smoky" flame effect which may achieve a high level of realism.

By varying the thickness and colour of the material which provides the flame effect means, and by varying the thickness of the slits, the colour and power of the lamp, and the degree of fogging on the screen, a high quality flame effect means may be produced over a wide range of visual outputs.

Alternative to the use of the flame effect means being provided by a sheet of flexible material, the flame effect means may comprise a plurality of ribbons.

There will now be given a detailed description, to be read with reference to the accompanying drawings, of a space heater which is a preferred embodiment of this invention, having been selected for the purposes of illustrating the invention by way of example.

In the accompanying drawings:

FIGURE 1 is a vertical sectional view of an electric fire which is the preferred embodiment of this invention;

FIGURE 2 is a schematic perspective view, illustrating principles of performance of the fire; and

FIGURE 3 is an enlarged view illustrating the production of "openings" in the flame effect means.

The space heater which is the preferred embodiment of this invention is an electric fire, comprising a housing 4 having a base 6 and a rear wall 8. Located forwardly of the front wall 10 an illuminated coal effect 12 may be provided, in conventional manner. Heating means (not shown) is also provided, in conventional manner.

Suspended within the housing 4 from an upper support 13 is a sheet 14 of a lightweight flexible material, such as crepe-de-chine, said sheet being secured loosely by lower securing means 16, adjacent a lower end of the housing.

Mounted adjacent to the lower securing means 16 is a fan 18 arranged to direct a flow of air upwardly against the material 14, to cause the material to billow in an upward direction, and if desired, the lower end of the sheet may be secured to a rear wall of the fan housing.

As is seen from Figure 2, provided in the sheet 14 are a plurality of slits 20, said slits extending a majority of the height of the sheet 14, and being generally parallel to the side edges of the sheet, there being in the preferred embodiment perhaps sixteen such slits disposed uniformly width-wise of the housing 4.

Extending upwardly to an upper closure member 21 is a translucent screen 24, conveniently of perspex or glass.

Provided within the housing 10 adjacent a front face of the sheet 14 is a light source 28, arranged to direct light against the front face of the sheet 14, conveniently the light source simultaneously providing an illumination for a solid fuel (wood or coal) effect element 12.

Under the influence of the current of air directly upwardly across the sheet 14, the slits form openings 21 (see Figure 3), which move generally in the upwards direction as the sheet billows under the influence of the flow of air. However, alternatively the air flow may be directed downwardly, to cause the openings 21 to move in the downward direction. Light directed against the sheet 14 in part passes through the material itself, falling against a generally triangular reflector 32 mounted on the rear wall 8 of the housing, light reflected therefrom passing forwardly through the sheet 14 and through the screen 24.

Some of the light transmitted against the sheet 14 will also pass through the openings themselves in one direction of traverse of the sheet 14, whilst some light will pass through openings formed by the slits 20 in both directions of traverse of the light. This latter light appears through the screen 24, and hence to a viewer of the space heater as areas 30 of light moving upwardly of the screen, quickly dissipating due to the lower degree of incidence of light from the source 28 on the upper parts of the reflector 32, and by virtue of the shape of the reflector itself, simulating flickering flames.

The level of the background glow which will be observed on the screen 24 will primarily be produced by light being reflected from the front face of the material 14 through the screen. The intensity of the background glow will be determined in part of course by the colour of the material of the sheet 14, and may, if desired, be enhanced by a reduction in thickness, so that there is a small contribution to the background glow, by light being reflected from the reflector 32, and passing through the material 14 itself.

It has been found that, where the material 14 is afforded by crepe-de-chine which is black in colour, and the light source 14 is arranged to transmit a white light, a "smoky" flame effect is produced. Alternatively, a warmer effect may be produced, by the use of crepe-de-chine of a dark red colour, together with an orange light as the light source 14.

Alternative to the use of the sheet 14 of crepe-de-chine, the flame effect means may be provided by a plurality of ribbons, suspended between the reflector and the light source in a manner such that light passes from the source 28 to the ribbons, some light being reflected directly from the ribbons through the screen, other light passing the ribbons and being reflected by the reflector 32, whereby light falling on the screen is at a number of different levels. The ribbons may be of translucent material, such as crepe-de-chine, but may be partly reflective.

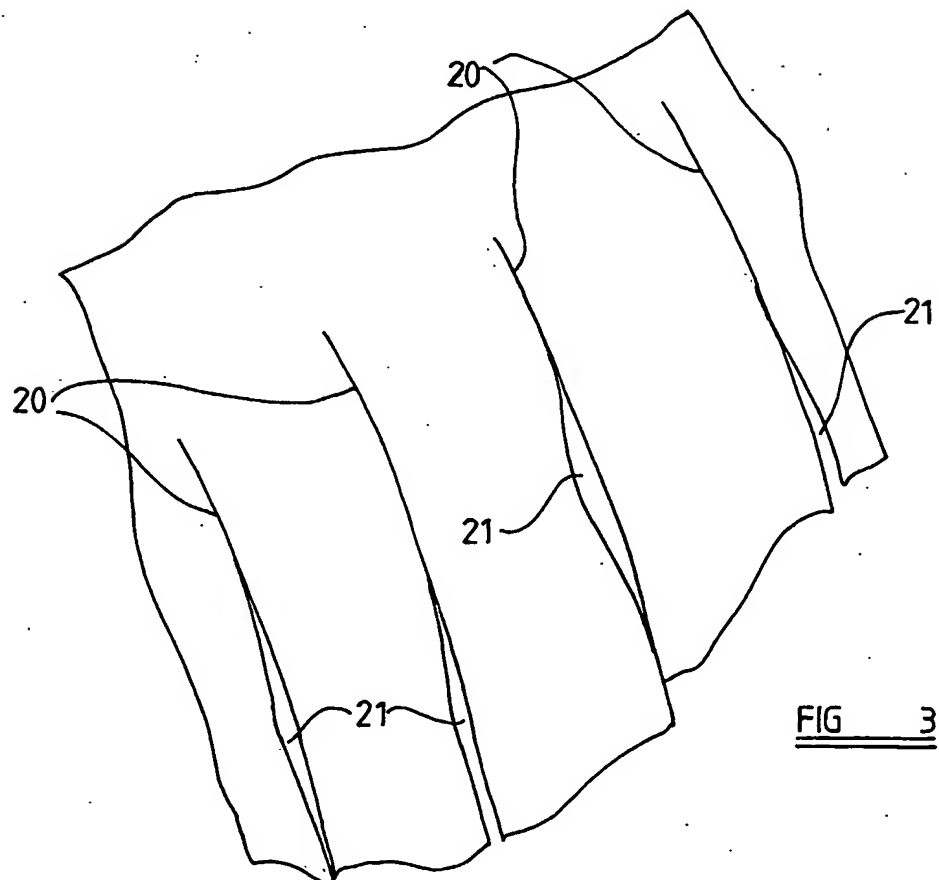
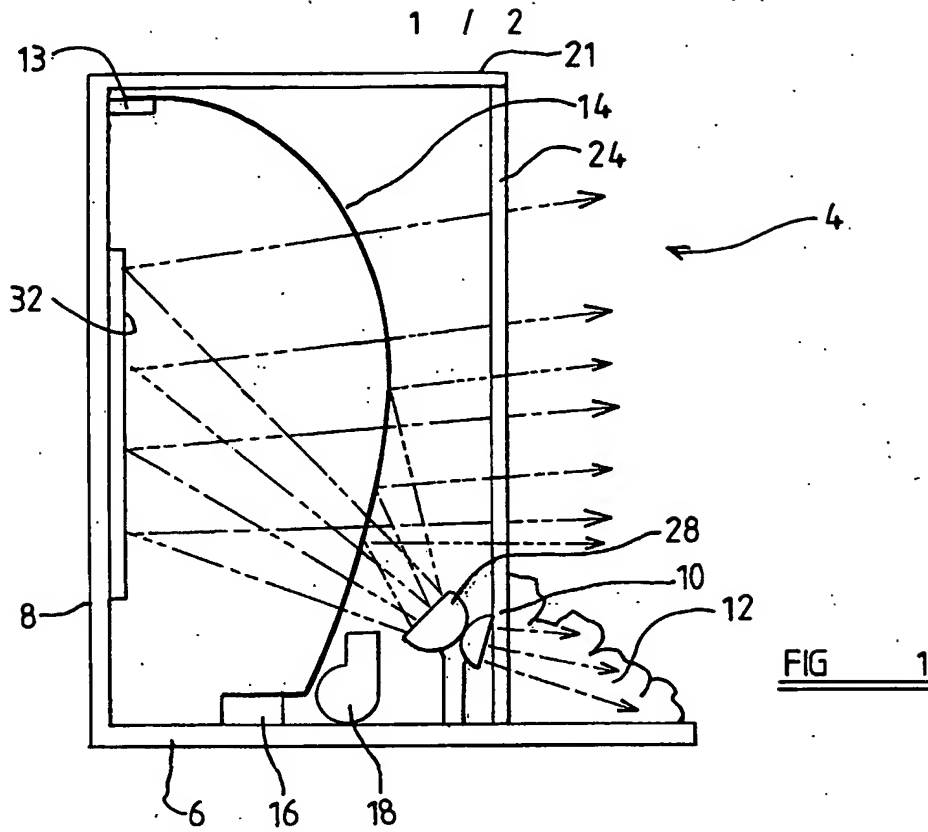
In the present specification "comprises" means "includes or consists of" and "comprising" means "including or consisting of".

The features disclosed in the foregoing description, or the following claims, or the accompanying drawings, expressed in their specific forms or in terms of a means for performing the disclosed function, or a method or process for attaining the disclosed result, as appropriate, may, separately, or in any combination of such features, be utilised for realising the invention in diverse forms thereof.

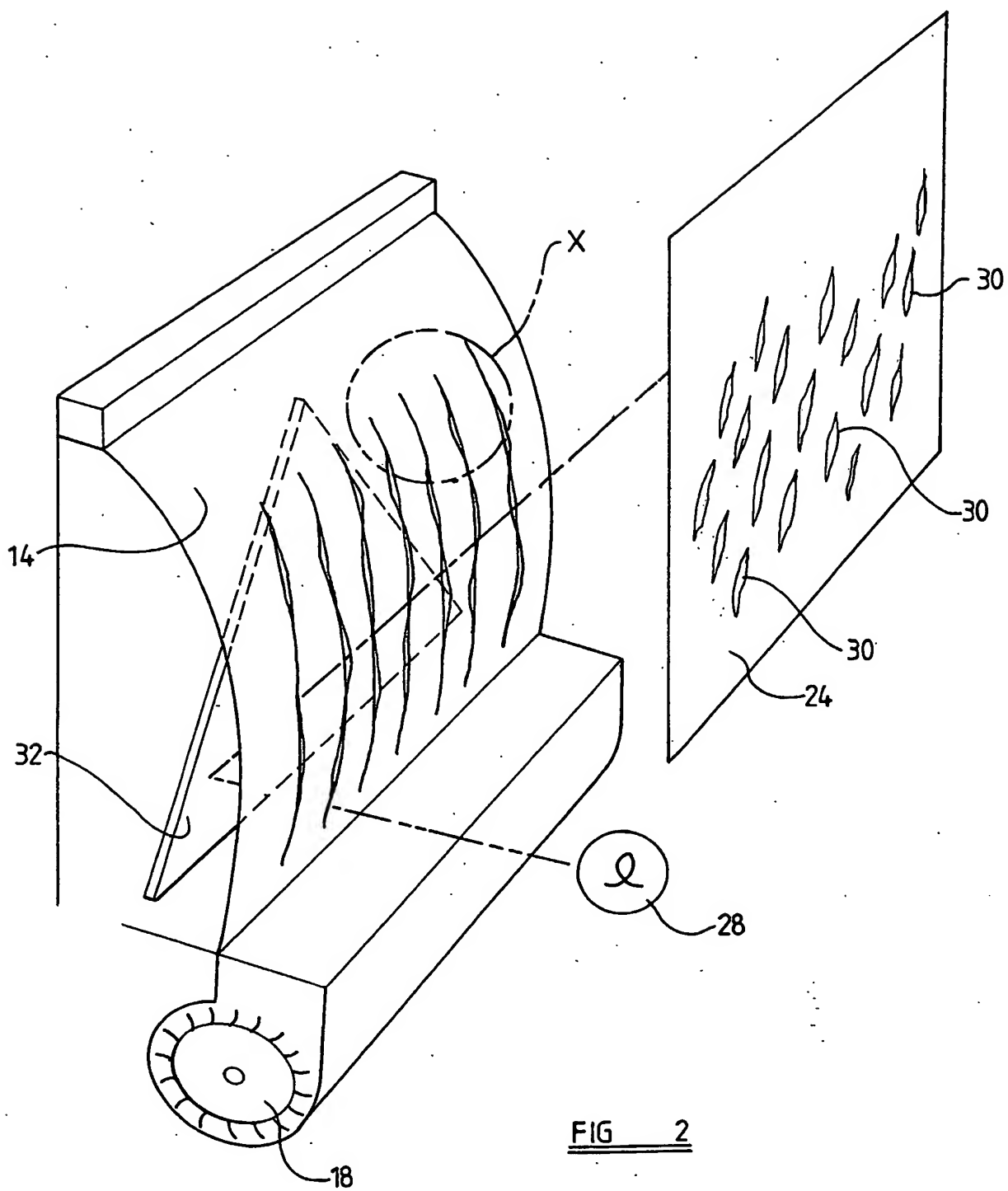
CLAIMS

1. A space heater comprising a housing (6) and flame effect means in the housing, the flame effect means comprising a source of light (28) to illuminate the flame effect means in the housing, and a screen (24) through which light is transmitted from the housing, characterised in that light is directed from the light source (28) through the flame effect means (14) onto a reflector (32), and reflected light passes again through the flame effect means (14) onto the screen (24).
2. A space heater according to claim 1 wherein the flame effect means comprises a sheet (14) of flexible material.
3. A flame effect means according to claim 2 wherein the sheet of flexible material is provided by a sheet of silky material.
4. A space heater according to one of claims 2 and 3 wherein the sheet of flexible material is crepe-de-chine.
5. A space heater according to any one of the preceding claims wherein the flame effect means is provided with openings (21).
6. A space heater according to claim 5 wherein the openings are elongate.
7. A space heater according to any one of the preceding claims wherein the material providing the flame effect means is suspended loosely within the housing, and means is provided to cause the material to "billow".

8. A space heater according to claim 1 wherein the flame effect means comprises ribbons, means being provided to cause the ribbons to move.
9. A flame effect means according to any one of the preceding claims wherein light passing through the screen is provided at a number of different levels.
10. A space heater substantially as hereinbefore described with reference to and as shown in the accompanying drawings.
11. Any novel feature or novel combination of features described herein and/or in the accompanying drawings.



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FIG 2

INTERNATIONAL SEARCH REPORT

Internat. Application No.

PCT/GB 03/00058

A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 F24C7/00

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 F24C

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

WPI Data, EP0-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 0 348 137 A (THIRD DIMENSION LIMITED) 27 December 1989 (1989-12-27) column 11, line 48 -column 12, line 55; figures 6,6C ---	1
A	WO 01 04544 A (BURLEY APPLIANCES LTD ;BRISTOW GARY (GB)) 18 January 2001 (2001-01-18) abstract ---	1
A	US 6 269 567 B1 (MACPHERSON DAVID MILLER ET AL) 7 August 2001 (2001-08-07) -----	

☐ Further documents are listed in the continuation of box C.

Patent family members are listed in annex.

* Special categories of cited documents :

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- *Y* document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.
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Date of the actual completion of the international search

12 May 2003

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/GB 03/00058

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